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Title : GAIT ANALYSIS AND CLASSIFICATION USING FRONT VIEW MARKERLESS MODEL

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Gait abnormality recognition would be very useful in medical monitoring and surveillance systems. The analysis can be used as one of the surveillance methods, medical rehabilitation monitoring and early detection in possible gait related symptoms. Existing manual observation can only be done by professionals and might cause misidentification on the real condition or situation of the subject. Additionally, gait laboratory utilises very costly motion systems for gait acquisition as research database. Hence, there is a need to produce a low cost abnormal gait detection method. In this research, analysis of front view human gait silhouette was done to investigate the possibility of a method to be developed in recognizing abnormality on proposed model-based approach. The model based which utilised the pendulum and hexagonal theorem as feature extraction method were used to produce the vertical angles of both hip and knee for 70 image sequences as feature vectors for both legs for one complete gait cycle sequence. Consequently, 280 features generated based on four parameters from the lower limb of human body for gait abnormality detection. On top of that, the gait features extracted from different gait patterns namely normal, drunken, dragging and tiptoed were classified as either normal or abnormal using four different classifiers namely ANN, KNN, SVM and Bayesian. Results attained showed that the proposed method was indeed suitable as gait abnormality recognition based on human gait pattern with the result of SVM as 90.9 percent leading the other classifier for pendulum features, whilst both ANN and SVM classification rate shows the highest for hexagonal features with also 90.9 percent after normalization and feature selection. Further, the proposed method namely the markerless front view modelling for abnormal gait detection was evaluated using hardware based. The hardware utilised a Linux based embedded board such as Raspberry Pi and Beaglebone, with Python software programming for recognising the differences between normal and abnormal gait based on gait image as input sequences captured from camera. Classification rate obtained were similar using these two boards namely 84.21% for SVM and 89.47% for KNN classifiers. In addition, processing time taken using Beaglebone Black board was higher that was approximately one minute as compared to Raspberry Pi that required longer time.